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Welfare losses due to low employment rates: an exploratory analysis for The Netherlands

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This article aims at measuring the individual and national welfare losses due to low employment rates. The calculations are made from a microeconomic point of view and based on assumptions of the human capital theory. Welfare losses are measured as the hypothetical loss of production resulting from one additional year of interruption or postponement of the working career. Depreciation of human capital due to non-use in the interruption period and foregone experience are taken into account. The welfare losses are estimated for individual cases with specific characteristics with respect to age, educational level and length of interruption spell and multiplication factors are used to calculate the national welfare losses.

I. THE PROBLEM

The employment rate, i.e. the ratio of the number of persons with a paid job in The Netherlands and the total population between the age of 15 and 65, is low in comparison to other industrialized countries. In 1987, 37% of the total female population aged between 15 and 65 years had a paid job (Germany: 47%, Denmark: 71%), whereas in the same year the employment rate of men in The Netherlands amounted to 69% (Germany: 74%, Denmark: 83%). Today, low labour participation in combination with high transfer payments for social security is one of the main economic policy problems in The Netherlands. This article considers the three major elements of this low employment rate, viz. the high number of unemployed persons, the huge number of recipients of public disablement benefits and the low number of women participating in employment. Figure 1 shows the development in unemployment and disablement. Unemployment has fallen since 1984, whereas disablement has been increasing over the reference period. Since 1986, the number of recipients of public disablement benefits has been higher than the number of unemployed persons.[1]

Obviously, the low employment rate incurs costs both for the individual non-participant and for the society as a whole. These costs are associated for example, with efficiency losses due to income transfers from participants to non-participants, loss of production and depreciation of human capital. With respect to unemployment, Feldstein (1978) and Okun (1981) provide a classification of the various costs, whilst the European Trade Union Institute (1984), Mittelstadt and Roberti (1984) and Junankar (1989) give estimates of total costs of unemployment under alternative assumptions. Junankar presents a low- and a high-costs scenario for several European countries using estimates based on Okun's law. The results show that in 1983 the costs of unemployment varied from 13% to 21% of the Gross Domestic Product (GDP). Using a different calculation method, the European Trade Union Institute estimates the potential production from Gross National Product and unemployment. The results of 1982 vary from 9.4% to 25%

[1]According to recent estimates, registration problems result in actual unemployment being some 40% lower than the level of unemployed persons registered at the public employment offices. The main problem is that the public employment offices are not notified in time that unemployed workers have found jobs.

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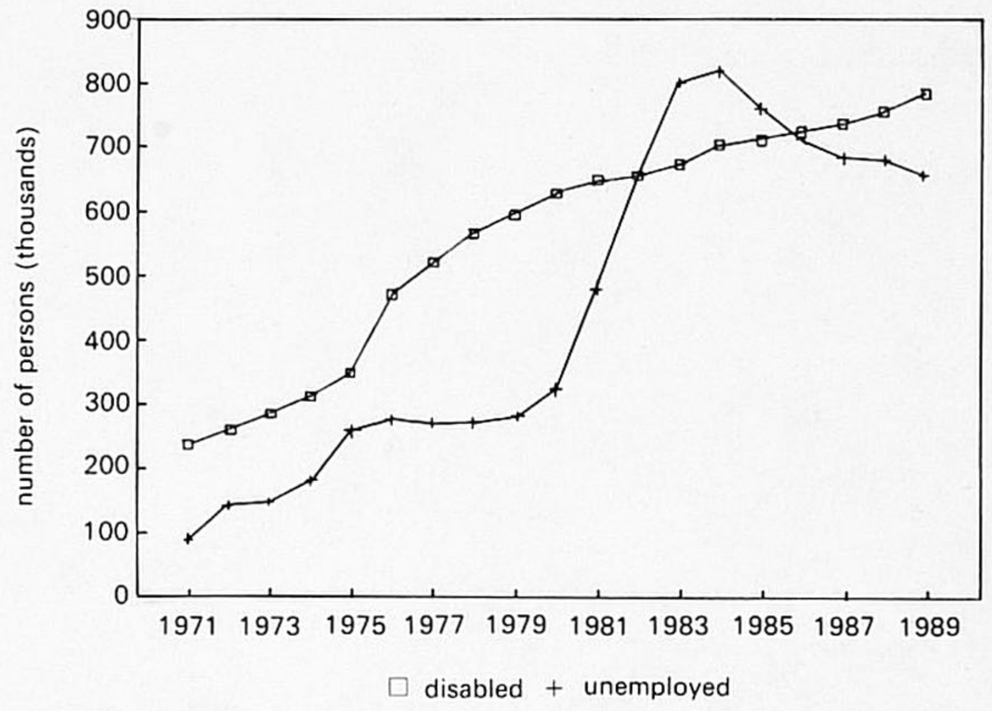

Fig. 1. *Development of unemployment and disablement in The Netherlands, in persons*

of the GNP in The Netherlands, depending on whether or not an Okun factor is used. In the lower benchmark estimate of Mittelstadt and Roberti, the total loss of production due to unemployment in the OECD-area amounts to about 6% of OECD output.

This article looks at the (opportunity) costs of low employment rates from a different angle. It presents calculations of what we call welfare losses due to low employment rates on the individual and on the national level. Essentially these welfare losses refer to foregone present earnings and foregone future earnings capacity. Welfare benefits due to increased leisure or household production are ignored. It is also assumed that non-participation is involuntary. The assumptions underlying our calculations of foregone earnings and earnings capacity stem from human capital theory. It is noted that human capital theory has been applied in calculating the value of household production by calculating opportunity costs. Our study basically uses the same principles, but the new elements in our analysis of estimating the welfare losses of non-participation in employment are that we account for depreciation of human capital and foregone work experience. Although our calculations refer to The Netherlands and are inspired by the low employment rate, the methodology is applicable generally.

The aim is to provide a framework for the policy discussion on the individual and social welfare losses associated with low employment rates. Our definition of welfare losses implies a number of assumptions, which are made explicit in the calculations. A sensitivity analysis may reveal the importance of these assumptions. However, the resulting monetary value of total welfare losses should not be interpreted as the gain of 'social welfare' in case participation increases to normative levels. There are two reasons. Firstly, the possible costs of creating jobs for the new participants are not considered and the diminishing marginal productivity and consequently lower wages, when numerous new workers enter the labour market, are not accounted for. Secondly, no social welfare gains at all can be obtained by enhancing labour participation, when the present (low) participation would be optimal from the point of view of social welfare and would mirror the preferences revealed. Then welfare losses due to the decrease in leisure and household production (which by assumption is ignored in the calculation of welfare losses) would counterbalance the increase in welfare due to the increase in employment rate. The policy discussion indicates that the latter is not the case in The Netherlands.

In Section II the concept of individual welfare losses is defined and the assumptions underlying our calculations are specified. Section III explains the method by which individual welfare losses are calculated. In Section IV this method is illustrated by calculating the welfare losses for some specific cases. In Section V the national welfare losses of a low employment rate are calculated. In Section VI the sensitivity of our calculation method is investigated. Section VII concludes.

II. DEFINITIONS

The previous section describes welfare losses due to low employment rates as the hypothetical loss of production.[2] However, as a basis for actual calculations of welfare losses, the above intuitive notion of this concept is much too vague. Therefore, this section provides an operational definition and lists a number of assumptions underlying the calculations. Moreover, welfare losses should be clearly distinguished from collective costs. The latter are, for a large part, actual costs, which incur directly from low employment rates. Social security transfers to non-participants are an easily quantifiable part of these collective costs. Some collective costs are hypothetical as well, such as tax payments and social security contributions, which cannot be collected because of the low level of income and expenditure as a result of the low employment rates.

The literature considers welfare losses as potential losses of both present and future production. This study defines the welfare loss at the individual level as the costs incurred by that individual from one extra year of joblessness. There-

[2]Possible social or political costs are not considered. Social costs may occur because of a possible relation between non-participation and criminal behaviour. Political costs may occur because of civil disobedience and a low tax moral due to the large transfer payments from workers to non-participants. Moreover, growing racism and political extremism may lead to political costs. Furthermore, collective costs and welfare losses are not completely independent. Not only will non-participants pay less taxes during their spell of non-participation but also afterwards, since they will earn less after their re-entrance to employment than persons with the same characteristics who have remained in employment.

fore, the size of the loss of production when an individual non-participant enters employment at year $t+1$ instead of year t is calculated. In the calculations of the potential production the depreciation of human capital is accounted for and the foregone work experience incurred during this extra year of joblessness is ignored.

Distinction is made between primary and secondary welfare losses. Primary welfare losses are potential production losses in year t, including the actual depreciation of human capital in that year. Secondary welfare losses occur because of future losses of production. These costs relate to the depreciation of human capital itself, as a consequence of being out of employment for one additional year. These costs in year t are defined as the difference between potential production of that person over the remaining part of his working life when re-entry to employment occurs in year t, and the potential production with re-entry in year $t+1$. This loss of human capital is not only determined by the difference in number of years which remain for production, but also by the depreciation of human capital during the extra year of joblessness. Including these secondary welfare losses, which are inevitable future welfare losses due to low employment rates, is a novelty of the approach used.

Primary welfare losses are flow figures and are expressed in guilders a year. Secondary welfare losses are equal to the difference between two stock figures, expressed in guilders over the remaining working life. Therefore, secondary welfare losses are flow figures as well and can be added consistently to the primary welfare losses in order to obtain total welfare losses.

Individual welfare losses are calculated as potential production losses that depend on the individual's characteristics with respect to education, work experience, age and the duration of non-participation. Therefore, each case considered relates to a group of people who are homogeneous with respect to the above characteristics. The yardstick for the calculation of potential production is a person with the same characteristics with full working hours who has never left employment.

The calculation of the welfare losses requires a number of assumptions concerning potential production and the depreciation of human capital of the non-participant. As a matter of fact, these assumptions define our notion of welfare losses. A sensitivity analysis may clarify the relative importance of these assumptions. Distinction is made between two types of assumptions, viz. the assumptions with respect to the calculation of the individual welfare losses and those which relate to the aggregation of individual welfare losses to national welfare losses. Obviously, the latter assumptions are most heroic.

Firstly, it is assumed that, on the individual level, wage costs fully and correctly reflect labour productivity and the actual wage costs are used as a basis for the calculation. Hence, on the national level, it is assumed that a mass entrance of non-participants to employment will not lead to a general fall of labour productivity. Moreover, it is assumed that there is no selectivity bias and, hence, that the least productive will not be the first to lose their jobs and become non-participants. Non-participants are assumed to enter employment into full-time jobs.

Secondly, it is assumed that there will be no demand constraints (and, hence, no surpluses of supply) when all non-participants, up to some normative level of participation, become productive. Hence we do not consider the costs involved in creating jobs for the non-participants. One is obliged to make this assumption because one looks at individual welfare losses, and does not compute feedback effects on a macro level by, for instance, using a macroeconomic model. Therefore, the calculation of the individual welfare losses can, when aggregated over all relevant non-participants, be regarded as gross welfare losses. They may constitute an upper limit for the macroeconomic costs of non-participation.

The third assumption is that all non-participants up to a specific level would accept an offered job. This assumption relates especially to the female non-participants, and becomes relevant when aggregating individual welfare losses. Yet, this assumption is implicit when calculating individual welfare losses. This assumption also implies that work within the home and voluntary work are considered to be non-productive, in the sense that no welfare losses occur when non-participants doing that work get a paid job. Alternatively, our measure of welfare losses can, in case of female non-participation, be regarded as the opportunity costs of household production.

The fourth and the last assumption relates to the fact that one uses estimates of age–wage costs profiles from available earnings data. When using these data with respect to different levels of education it is implicitly assumed that all participants are employed exactly in accordance to their specific level of education and capabilities, and that nobody has a job which requires a higher education or has a job which could be held by somebody with less capabilities. Obviously, in reality this is not the case. If there is a difference between the education required for a job and the education of a person, it influences the earnings involved. In The Netherlands overeducation as well as undereducation are rewarded lower than required education, with approximately the same amount (Oosterbeek, 1992). This phenomenon is not exclusively Dutch: there is similar evidence for the US labour market (Rumberger, 1987). However, the Dutch labour market differs from the US labour market in two respects. Firstly, in The Netherlands there is substantially less overeducation than there is in the US. Secondly, while in the US there is much more overeducation than there is undereducation, in The Netherlands both are almost balanced. Therefore, the fourth assumption, which implies that, on the national level, overeducation is compensated by the same amount of undereducation seems to be a reasonable one.

III. WELFARE LOSSES AND DEPRECIATION OF HUMAN CAPITAL

Age–income profiles are specified in several functional forms. Years of education and work experience, or age, are most common amongst the variety of variables postulated to explain earnings during the life cycle. Most empirical studies take the natural logarithm of earnings as the dependent variable. The number of years of schooling as an explanatory variable is usually specified as a level, while for work experience a quadratic specification is used. There is much discussion in the literature on the validity of the latter specification. According to Murphy and Welch (1990), the quadratic functional form results in estimates of the earnings profile, which are significantly biased. They suggest a quartic specification. One of the problems when using a quadratic (or even a quartic) specification is that earnings decline in the late career of individuals. The decline originates in empirical estimates of age–earnings profiles that use cross-section data, in which cohort-effects and actual age effects are mixed.[3] However, given the institutional arrangements with respect to the wage formation in The Netherlands, there is no actual decline of earnings if workers get older. The Appendix shows that, conditional on the educational level, oldest workers have the highest wages in The Netherlands. A quadratic specification obviously does not describe this phenomenon adequately. Therefore, a logarithmic specification of working experience is adopted in which there is no decline in wages in the late career of individuals:

$$\ln y_T = [a + b \ln (x + c)] \tag{1}$$

where y_T is the income at age T and x is the work experience. Note that if this person enters his first job, his work experience is equal to zero and his income will be $\exp [a + b \ln (c)]$. Coefficient c may be interpreted as 'pseudo'-work experience which is acquired during the educational career. Figure 2 summarizes the main theoretical arguments with respect to the disruption of a working career using age–income profiles. (See e.g. Groot *et al.*, 1988; Mincer and Ofek, 1982). For the sake of simplicity, income is drawn as a linear function of age; however, actual age–income profiles usually show diminishing increases of income with age.

Line ABL of Fig. 2 represents the profile of a worker who has a paid job from leaving school until retirement. The profile ABCDEFG mirrors the income of an individual who disrupts his working career at age V. In the disrupted-working career case four stages are distinguished: the period

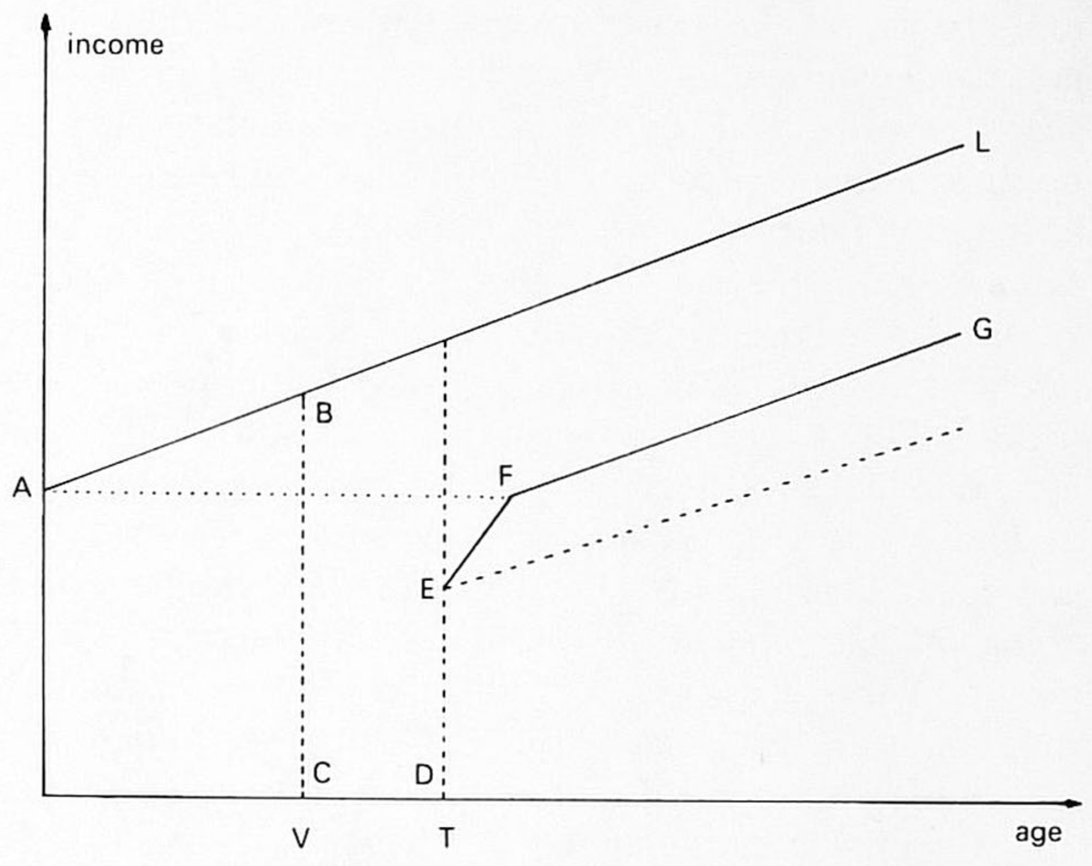

Fig. 2. *Linear age–income profile for a continuous and an interrupted working career*

before interruption (AB), the interruption period (CD), the restoration period (EF) and the post-restoration period (FG).[4] The presence of these theoretical stages has been tested in several empirical studies, the results of which will be summarized below. Assumptions are then made concerning these different stages, on the basis of the results presented here.

When the worker re-enters a job his wage will be lower than when he left employment, due to the depreciation of the stock of his human capital. The theory of human capital provides a number of arguments for this depreciation, some of which are summarized under the heading atrophia (see Groot *et al.*, 1988, p. 220). There are several empirical studies on the yearly depreciation rate during the interruption period and there appears to be much divergence between the results. They vary between 0% (Corcoran, 1979) and 9% per year (Mincer and Ofek, 1982). It is assumed that human capital depreciates during the interruption period by 5% per year.

In the period immediately following re-entry, human capital will be restored rapidly because of the new work experience. In this restoration period wages rise quickly. Mincer and Ofek (1982) estimate this so-called rebound effect to be 5.8% to 6.4% in the first year after re-entry. In the present study a rapid recuperation is abstracted.

In the post-restoration period it is assumed that the growth rates of income of workers with and without interruption are equal. Both types of person spend part of their time investing in human capital so that their investment

[3]A maximum wage at age 41 was found when a quadratic specification using the data of this study was estimated.
[4]The line ABCDEFG (Fig. 2) is the profile of an involuntary interrupted working career. In the literature (Mincer and Polachek, 1974; Mincer and Ofek, 1982; Cox, 1984) it is often mentioned that an individual who anticipates an interruption of his career accumulates less human capital in the period before interruption (AB) than a worker who expects a continuous career of paid work. The slope of the line AB will be less steep in the case of an expected interruption than in the case where no interruption is expected.

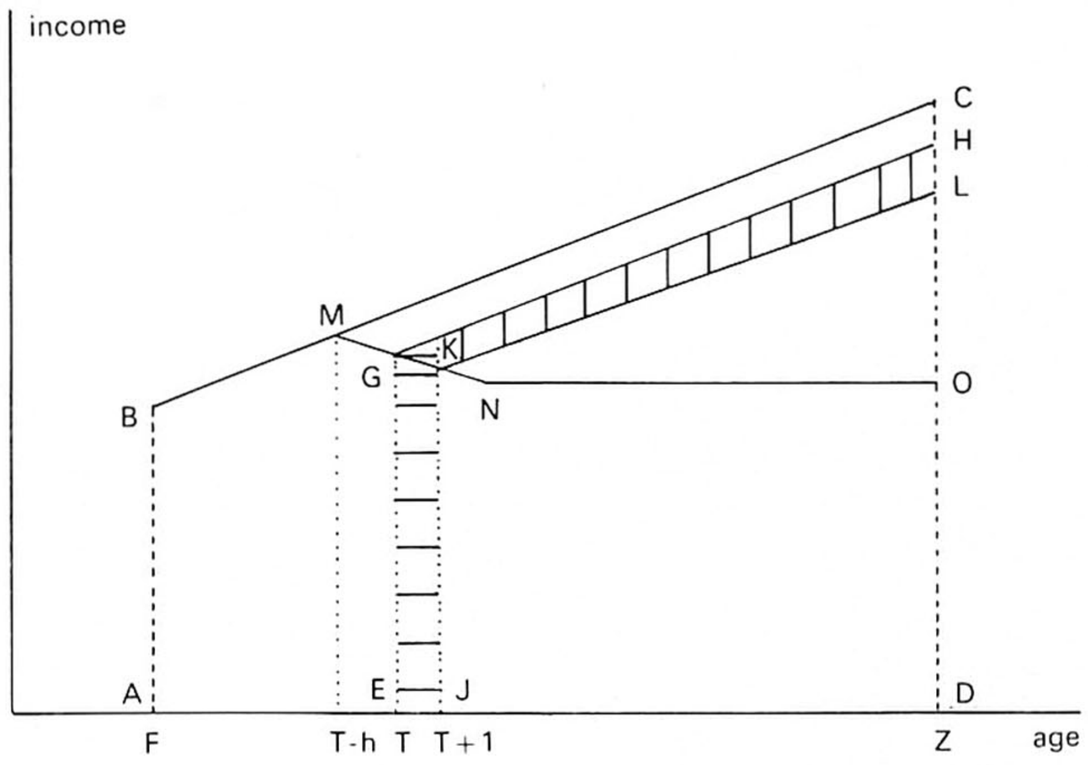

Fig. 3. *Primary, secondary and total welfare losses of non-participation according to the age–income profile*

ratio (the ratio of investment expenditures to gross income) will be equal, which is in line with various empirical studies (Mincer and Polachek, 1974; Corcoran, 1979; Mincer and Ofek, 1982). Additionally, it is assumed that the actual depreciation of human capital does not continue indefinitely: There is a minimum level of human capital. It is assumed that actual depreciation lasts only for two years. After two years the earning capacity of the non-participant remains constant (Möller, 1990).

Figure 3 depicts the income and depreciation profiles for a (non-)participant and graphically illustrates our calculation method. In the case of a continuous working career the worker of Fig. 3 has a lifetime income equal to the area ABCD. It is assumed that he enters employment at age F and retires at age Z.

Now suppose that this person interrupts his working career at age $T-h$. Hereafter, investment in human capital stops and, instead, depreciation takes place. If this person never finds a job, his earning capacity is indicated in Fig. 3 by the kinked line MNO. The horizontal part of this line is a result of the assumption that depreciation is bounded by some minimum level.[5] This assumption can be formalized for the depreciation factor ρ as follows:

$$\rho = \begin{cases} 1-h\delta, & \text{for } (1-h\delta) > \rho^* \text{ (line MN)} \\ \rho^*, & \text{for } (1-h\delta) \leqslant \rho^* \text{ (line NO)} \end{cases} \tag{2}$$

where ρ is the total depreciation ratio of human capital $(=1-h\delta)$, ρ^* is the maximum depreciation ratio, h is the length of interruption period in years at year T and δ is the annual depreciation rate of the stock of human capital.

If this person finds a job, his lifetime earnings over the post-interruption period will be equal to area EGHD. If this worker postpones his re-entry for a further year, commencing work at time $T+1$ rather than T, his lifetime income over the post-interruption period will be the area JKLD.

The individual welfare losses are calculated as losses resulting from the delay of one year in re-entering employment. These losses are equal to the difference of the area EGHD and the area JKLD. This is the shaded area in Fig. 3.

The calculation method can be formalized as follows. When no interruption takes place, the earnings of a representative worker at age T are equal to

$$y_T = \exp\left[a + b \ln (x+c)\right] \tag{3}$$

where y_T is income at age T and x is the work experience.

The above formulation of the income profile implies a decreasing investment ratio of human capital with growing age. Next the potential wage at age T of the person who has left employment at age $T \dot{-} h$ is calculated as

$$y^{\mathrm{p}}_{T,h} = \exp\left[a - \ln \phi + b \ln (x+c)\right] \tag{4}$$

where $y^{\mathrm{p}}_{T,h}$ is the potential income at age T with length of the interruption period h, y_{T-h} is the income at moment of interruption, and ϕ, given by $\phi = y_T/(y_{T-h} * \rho)$ represents both the lack of work experience (y_T/y_{T-h}) during the period of interruption and the depreciation of human capital $(y_{T-h} * \rho)$.[6] It calculates the income difference between a worker with a continuous and an interrupted career at the moment of re-entry in employment.

When this representative non-participant does not enter employment again at moment T but at moment $T+1$, his potential income will be

$$y^{\mathrm{p}}_{T+1,h+1} = \exp\left[a - \ln \eta + b \ln (x+c)\right] \tag{5}$$

where

$$\eta = y_{T+1}/(y_{T-h} * \rho).$$

Note that not only income at moment T or at moment $T+1$ is relevant for calculating the individual-welfare losses but also the income earned over the rest of the working life. In order to calculate this remaining lifetime income (indicated by the areas EGHD or JKLD in Fig. 3), the discounted value of these future earnings at period T is calculated (with T the base year for the calculation of the welfare losses of one additional year of non-participation). The discounted value of the remaining lifetime income in the

[5]This minimum level and, hence, the period during which actual depreciation takes place, may differ according to the educational level of the representative worker.

[6]By including the loss of skills in ϕ correction factors do not have to be included in the term $\ln x$ in the above earnings equation. Thus, the term $\ln x$ is equal for workers with continuous and interrupted working careers when both belong to the same homogeneous group with respect to education and age.

case of re-entry at moment T is equal to

$$\pi_{T,h} = \int_{T}^{Z} y^{p}_{t,h} * e^{(T-t)r}\, dt \qquad (6)$$

where $\pi_{T,h}$ is the discounted value at T of potential remaining lifetime income in the case of re-entry at T, Z the age of retirement and r the discount rate (=long-term interest rate).

The discounted value of the remaining lifetime earnings in the case of re-entry at moment $T+1$ is equal to

$$\pi_{T+1,h+1} = \int_{T+1}^{Z} y^{p}_{t,h+1} * e^{(T-t)r}\, dt \qquad (7)$$

where $\pi_{T+1,h+1}$ is the discounted value at T of potential remaining lifetime earnings in the case of re-entry at moment $T+1$.

Now total individual welfare losses of one additional year of non-employment are equal to the difference of these two discounted values for the remaining lifetime earnings:

$$y^{*}_{T,h} = \pi_{T,h} - \pi_{T+1,h+1} \qquad (8)$$

where $y^{*}_{T,h}$ is the total individual welfare losses because of one additional year of non-participation at T in case of an interruption period of length h. The total welfare losses defined above can be segregated into primary and secondary welfare losses in the following manner:

$$y^{pl}_{T,h} = \int_{T}^{T+1} y^{p}_{t,h} * e^{(T-t)r}\, dt \qquad (9)$$

where $y^{pl}_{T,h}$ is the primary welfare losses of one additional year of non-participation at age T with interruption of h years, and

$$y^{sl}_{T,h} = y^{*}_{T,h} - y^{pl}_{T,h} \qquad (10)$$

where $y^{sl}_{T,h}$ is the secondary welfare losses of one additional year of non-participation at age T with interruption of h years.

The profile of the income curve and depreciation curve depicted in Fig. 3 has the following implications for primary and secondary individual welfare losses:

- The cumulated investment in human capital increases with age. Hence, the primary welfare losses concerning non-participants who have left employment at a relatively high age are larger than those concerning younger workers with the same educational level.
- Secondary welfare losses decrease with increasing age of the non-participant, because the remaining working life becomes shorter with rising age.
- Primary and secondary welfare losses increase with the level of education, except for young workers at the start of their career. In that case the effect of higher education will be compensated by the effect of less working experience.
- When measuring the influence of the length of the interruption period on primary welfare losses one should distinguish between two cases:

  (a) the non-participant who is situated at the decreasing part of the depreciation curve: in that case primary losses will become lower when the interruption period has lasted longer;

  (b) the non-participant who is situated at the horizontal part of the depreciation curve: in this case primary welfare losses are independent of the length of the interruption period;

- Secondary welfare losses decrease with the length of the interruption period.

IV. CASE STUDIES OF WELFARE LOSSES

In Section II it was assumed that the wage costs reflect fully and correctly the labour productivity. Therefore, the theoretical framework of age–income profiles and the calculation method as explained in the previous section will be applied on wage costs instead of income. Using the methodology of Section III and the estimates of the age–wage costs profiles presented in the Appendix the individual-welfare losses for representative non-participants can be calculated. These representative non-participants are classified by three characteristics: level of education, age and start of interruption period (or, alternatively, number of years of non-participation). As an illustration of the calculation method and of the order of magnitude of individual welfare losses, this section discusses five hypothetical non-participants. All examples use the following assumptions:

- depreciation rate of human capital is 5% a year;
- lifetime earnings are discounted at a real long-term interest rate of 5%;
- work experience is measured as age minus years of full-time education minus 6;
- actual depreciation of human capital lasts for two years; after two years the earning capacity of the non-participant remains constant;
- every child is obliged to attend school until the age of 17;
- it is not possible to earn less than the minimum wage and, thus, produce less than the minimum wage costs.

Table 1 gives the results for these cases. The first case considers a 30-year old non-participant who has left employment at the age of 29 and has an extended primary education. At $T=30$ human capital of this non-participant has depreciated by 5%; and in the case where he is still not in paid employment at $T=31$, his human capital would have depreciated at that moment by 10%. However, when calculating the potential earnings of this non-participant one should not only reckon with the depreciation of human

Table 1. *Individual welfare losses for hypothetical non-participants (guilders, 1985)*

Cases	Primary welfare losses	Secondary welfare losses	Total welfare losses
Case 1 30-years old; extended primary education; out of employment at 29	36 600	54 500	91 100
Case 2 30-years old; completed academic education; out of employment at 29	79 500	118 200	197 700
Case 3 26-years old; completed academic education; did not enter employment at 24	45 000	64 400	109 400
Case 4 50-years old; primary education; out of employment at 50	47 900	30 600	78 500
Case 5 50-years old; primary education; out of employment at 44	39 900	4800	44 700

capital but also with the loss of work experience during the period of non-participation by the use of Equations 4 and 5, which makes the total depreciation percentages equal to 7.7 for $T=30$ and 15.7 for $T=31$. By subtracting potential lifetime earnings at $T=31$ from potential lifetime earnings at $T=30$ one obtains the individual welfare loss for this non-participant (see case 1 in Table 1).

The second example is a non-participant who is also 30-years old and has left employment at the age of 29, but has a completed academic education instead of an extended primary education. According to Table 1, the welfare losses of this second non-participant appear to be much higher than those of the first one. It is especially valid for the secondary welfare losses. The difference can be completely ascribed to the difference in level of education since both non-participants are equal with respect to all other relevant characteristics.

The third example considers a non-participant of 26 years with a completed academic education who has delayed the start of his working career: at $T=24$, he finished his education but did not get a paid job. As for all individuals the assumption is that the depreciation of human capital only lasts for two years, he is on the horizontal section of the potential earnings profile at re-entry (line NO in Fig. 3). Figure 4 reproduces the stylized age–wage costs profile for this particular non-participant. In this case the total depreciation of human capital at $T=27$ is equal to that at $T=26$. However, the loss of work experience is larger at $T=27$ than at $T=26$, because the reference worker who did start his working career at $T=24$ will have had an additional year of work experience. Table 1 shows that the welfare loss of this university graduate, who did not find a job after the completion of his study, is less than that of the non-participant of case 2. Two causes are responsible for this effect: compared to the individual in case 2, the university graduate with the delayed start of his career has accumulated less human capital through work experience and his interruption spell has been longer.

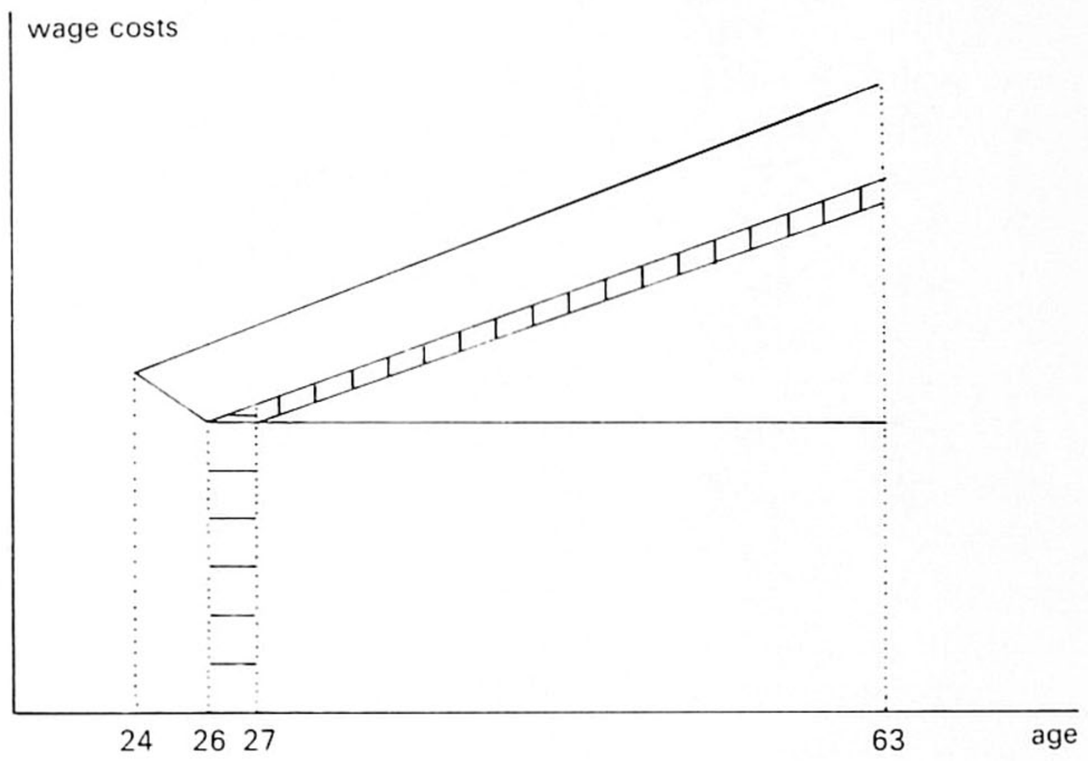

Fig. 4. *Age–wage costs profile of a university graduate who postpones entry to employment by two years*

In the fourth case the welfare loss is calculated for a non-participant of 50 years who has left employment in the same year and who has a primary education only. Table 1 illustrates that this relatively old non-participant incurs much smaller secondary welfare losses than a young non-participant. When old age is combined with a long interruption spell (case 5), it is seen that the secondary welfare loss becomes particularly small.

V. NATIONAL WELFARE LOSSES

The welfare losses of low employment rates on a national level are estimated using individual welfare losses of

Table 2. *Welfare losses on macroeconomic level, The Netherlands, 1985 (in billions of guilders)*

	Primary welfare losses	Secondary welfare losses	Total welfare losses	Percentage of GNP
Unemployment	18.8	9.0	27.8	6.6
Disability	4.9	0.3	5.2	1.2
Voluntary non-participation	59.0	12.7	71.7	17.1
Total	82.7	22.0	104.7	25.0

n groups of persons, which are homogeneous with respect to education, age and length of the interruption spell. Besides these data, one needs multiplication factors for the three subgroups mentioned in Section I: the unemployed, the disabled and the voluntarily non-participating people. For this the CBS data from the Labour Force Survey of 1985 were used.

In order to determine the multiplication factor of unemployment, it is assumed that frictional unemployment is a necessary condition for a well-functioning labour market and will, therefore, be excluded from the calculation of the welfare losses. The welfare losses of unemployment are calculated for about 400 thousand persons.

Among disabled people in The Netherlands, numerous of them have earning capacity. Due to labour market factors, like unemployment and technological development, persons were declared fully disabled although they still had the capacity to fulfill paid jobs. It is assumed that this hidden unemployment in disability is 14% (Vrooman and de Kemp, 1990) of the total number of disabled people, and amounts to about 100 thousand persons, who are able to fulfil a full-time job. Most of these people are assumed to be between the ages 50–65 years and have a primary or extended primary education. This assumption implies that the national welfare losses of disability are relatively small compared to unemployment and voluntary non-participation.

Voluntary non-participants in employment are assumed to be female. We take an adjusted labour force participation rate of men as a benchmark for women[7] and the total welfare losses of non-participating women up to this point is calculated. In doing so our calculations comprise 1.7 million women, who would be in employment when the benchmark participation rate is reached.

Table 2 presents the estimates of the total, primary and secondary welfare losses for the economy as a whole. All estimates are based on the same assumptions as in the case studies (Section IV).

Total welfare losses due to a low employment rate appear to amount to about 25% of GNP in 1985. The share of secondary welfare losses is not as large as most case studies in Section IV suggest. The reason for this is the distribution of the subgroups over the relevant characteristics. Numerous voluntary non-participants and disabled people have interrupted their career for a long period. Moreover, the working capacity of the disabled is assumed to be among the older people. As the fifth case study shows, secondary welfare costs are relatively low for those subgroups.

For unemployment the total welfare losses in 1985 are about 7% of the GNP. The latter percentage is in line with the percentage Mittelstadt and Roberti estimated for the OECD-area (6.1%) and the 9.4% of The European Trade Union Institute. The estimates of Junankar for unemployment are somewhat higher than the estimates of this article.

VI. SENSITIVITY ANALYSIS

The estimates of welfare losses due to low employment rates are based on a number of assumptions concerning the different stages in the career of a worker (Section III). In this section the sensitivity of our calculation method with respect to the following assumptions is investigated: the yearly depreciation rate of human capital, the long-term interest rate and the wage costs related to the minimum wage as the lower benchmark of productivity. In each alternative calculation, one assumption is varied and the results are compared with the central calculation. The results are summarized in Table 3.

Lowering the yearly depreciation rate of human capital has a relatively small impact on the total welfare losses. Although increasing primary and decreasing secondary losses are expected, the primary losses become only slightly more important. The small magnitude of this impact is caused by a combination of two effects: the minimum wage costs and the length of the interruption period. Labour productivity is bounded below by the minimum wage costs, which is particularly relevant for the estimation of welfare losses of voluntary non-participation. Because a large part of the voluntary non-participants experience long interruption periods, this minimum level is reached in the case of both depreciation rates.

[7]The labour force participation of men is adjusted in order to account for the male disabled individuals who have earning capacity and is related to the total male population in the age of 15–65.

Table 3. *Macroeconomic welfare losses in The Netherlands under different assumptions (in billions of guilders, 1985)*

	Disabled	Unemployed	Voluntary non-participants	Total	Percentage of GNP
Central assumptions[a]	5.2	27.8	71.7	104.7	25.0
primary losses	4.9	18.8	59.0	82.7	
secondary losses	0.3	9.0	12.7	22.0	
I. Depreciation 0.5%	5.7	25.7	73.7	105.1	25.1
primary losses	5.4	20.0	60.7	86.1	
secondary losses	0.3	5.7	13.0	19.1	
II. Long-term interest 2%	5.3	32.7	79.1	117.1	28.0
primary losses	5.0	19.1	59.9	84.0	
secondary losses	0.3	13.6	19.2	33.1	
III. No minimum wage	5.2	29.6	56.6	91.4	21.8
primary losses	4.9	18.4	45.4	68.7	
secondary losses	0.3	11.2	11.2	22.7	

[a]Depreciation of human capital is 5% a year, long-term interest rate is 5% a year, productivity is bounded below.

Lowering the long-term interest rate has an increasing effect on the total welfare losses and especially on the secondary losses. The long-term interest rate determines the weight of the future of production in the total losses. A low discount rate implies a relatively high share of secondary losses, while a high discount rate implies a low impact of secondary losses. These expectations are verified by the present calculations.

Table 3 shows that although the minimum wage costs, which bound productivity below, have an increasing effect on the total welfare losses, different effects are seen for the subgroups distinguished. The third sensitivity analysis shows us the effect of a release of the minimum wage level ($\rho^* = 0$ in Equation 2). The direction in which secondary losses are altered are dependent of the length of the period out of employment. There is no effect on the welfare losses of disability, because most earning capacity is among the age category 50–65 and they earn, even if one accounts for depreciation of human capital and forgone experience, more than the minimum wage level because of their age. After two years of non-participation, the earning capacity of this group does not fall below the minimum level, so that a release of this productivity restriction does not alter the welfare losses. For the unemployed, an increase in the secondary welfare losses is seen. Instead of reaching the minimum level after one year of non-participation, human capital depreciates for an additional year. The decrease of secondary losses for voluntary non-participation result from the long period of interruption. These non-participants are positioned on the horizontal part of the depreciation curve (line NO in Fig. 3). The release of the minimum wage level means a decrease of production at re-entry at T or at $T+1$. This results in a lower nominal growth of production caused by the assumption of equal investment ratios of individuals with the same age and educational level.

VII. CONCLUSION

The low employment rate is nowadays one of the major economic policy problems in The Netherlands. This article defines a framework and a methodology for computation of individual welfare losses due to these low employment rates. The individual welfare losses of non-participation are defined as the loss of potential productivity of a non-participant in the case of one additional year of non-participation. Thus, a distinction is made between primary losses due to the loss of potential production during one year and secondary losses which relate to the additional loss of potential earnings of the non-participant because of the depreciation of his human capital and the loss of additional work experience (no further investment in human capital). In calculating welfare, losses are abstracted from welfare effects due to changes in leisure or household production.

In order to illustrate this method the welfare losses are calculated for hypothetical individual cases. These calculations are based on estimates of age–wage costs profiles for five levels of education in The Netherlands using data for 1985. Of course, the value of these losses depends on a number of assumptions which have been made explicit. Therefore, the main aim of this article is to clarify how welfare losses can be calculated, and what assumptions are relevant in that respect. It is shown that the calculation of welfare losses requires empirical evidence on the speed and time shape of the depreciation of human capital, and on the investments in human capital after the interruption period. Finally, the individual welfare losses have been aggregated up to national-welfare losses by multiplication of the individual losses for homogeneous groups of non-participants by the number of people belonging to these groups. The national welfare losses due to low employment rates are estimated to amount to 26% of the Gross National Product

in 1985. About 70% of this loss originates from voluntary non-participating women, 25% is caused by unemployment and 5% by disablement.

The sensitivity of the calculations was tested by varying some assumptions on the implicit definition and depreciation of human capital. It appears that the calculated welfare loss is sensitive to the assumptions concerning the minimum level of productivity and the discount rate. Variation in the yearly depreciation rate of human capital has only a small effect on the total welfare losses.

The aggregation of the individual welfare losses to total welfare loss at the macro level poses a problem of interpretation. Obviously, the welfare losses in Tables 2 and 3 are no huge golden mountains, which, in terms of 'social welfare', can costlessly be digged off. These losses are the aggregated opportunity costs of the individual non-participants associated with their idle productive capacity and with the depreciation of their future productive capacity. Nonetheless, from the point of view of social welfare, the present low employment rate could even be optimal. In that case the welfare costs of enhancing labour participation would be higher than the loss of productive capacity. Then the welfare losses calculated by us are like the pot of gold at the end of the rainbow that nobody really wants to delve. However, the policy discussion in The Netherlands, with a strong emphasis on 'workfare' instead of 'welfare' suggests that employment rates are too low from the viewpoint of social welfare and that welfare gains can be obtained by an increase. The definition of welfare losses implicit in the calculation method of this article tries to quantify some aspects of that discussion. Yet, it is emphasized that the welfare loss calculated here should be considered as a gross welfare loss, since the costs, productivity decline and the demand constraints associated with the new jobs for the non-participants are not accounted for. In future research one may analyse the effects of these macroeconomic feedback mechanisms both by a further sensitivity analysis and by the use of a macroeconomic policy model.

List of symbols

r = discount rate (=long-term interest rate)
DH = dummy for higher vocational education
DS = dummy for secondary education
DE = dummy for extended primary education
DA = dummy for academic education
h = length of interruption period in years
s = years of education
x = work experience ($T-s-6$)
y_T = income at age T
y_{T-h} = income at moment of interruption
$y^{p}_{T,h}$ = potential income at age T with h the length of the interruption period
$y^{*}_{T,h}$ = total individual welfare losses because of one additional year of non-participation at T in the case of an interruption period of length h
$y^{pl}_{T,h}$ = primary welfare losses of one additional year of non-participation at age T with interruption during h years
Z = age of retirement
δ = annual depreciation rate of the stock of human capital
ϕ = $y_T/(y_{T-h} * \rho)$
η = $y_{T+1}/(y_{T+1-h} * \rho)$
$\pi_{T,h}$ = discounted value at T of potential remaining lifetime income in the case of re-entry at T
$\pi_{T+1,h}$ = discounted value at T of potential remaining lifetime income in the case of re-entry at $T+1$
ρ = total depreciation ratio of human capital = $1-h\delta$
ρ^* = maximum depreciation ratio

APPENDIX: ESTIMATION OF AGE–WAGE COSTS PROFILES FOR THE NETHERLANDS

The estimates of the age–wage profiles are based on aggregated cross-sectional data on earnings distinguished by age group and educational level. As discussed in Sections II and III there are several problems connected to the use of these data. Firstly, it is assumed that earnings are related to the individuals, whereas at least some part of the earnings will be connected to the jobs workers hold. Some of the workers have the education that is required for the job, but others are overeducated or undereducated. Since, in The Netherlands, there is on average as much overeducation as undereducation, this assumption is a reasonable approximation. Secondly, data are used on one cross-section, in which the earnings reflect a combination of age and cohort effects. For the estimation of the primary costs this is not very important, but for the estimation of the secondary cost one should distinguish both effects. However, for this panel data are needed, or a number of subsequent cross-sections, which are not available. Thirdly, there is the question of functional form with respect to the effect of working experience. If the traditional quadratic form is used and applied to the cross-sectional data, it would imply that earnings decrease for higher age groups. This is not only an implausible development from the perspective of the individual worker and is inconsistent with the empirical observation (Table A1 gives the data on gross wages and shows how they rise with age and with the level of education), but also has the implication that secondary costs of non-participation may become negative. That would be the case, if the calculated decline in earnings according to the quadratic age–wage profile is larger than the calculated decline in earnings due to non-participation. Therefore, a logarithmic specification was

Table A1. *Average gross monthly wages on a full-time basis of workers in the manufacturing and service sectors in The Netherlands in 1985*[a]

	Level of education				
Age in years	Primary	Extended primary	Secondary	Higher vocational	Academic
16–19		(1298)			
20–24		2124	2220	2444	(3208)
25–29		2699	2906	(3054)	3739
30–34		3045	3436	(3693)	4817
35–39	(2870)	3255	3695	(4394)	5925
40–44	(2916)	3416	4099		6609
45–49	(3001)	3464	(4234)		7212
50–54	(3057)	3526	(4214)		7329
55–64		(3630)	(4562)		7924

[a]Wages in parentheses are based on 100–150 observations, those without parentheses on more than 150 observations.

used which rules out the possibility of a declining wage as age increases.

In order to calculate welfare losses for individual non-participants using the methodology of Section III, one needs, amongst others things, values for the constant term a and the parameters b and c of the age–wage costs profile of Equation 3 for each level of education. In order to measure these parameters, Equation 3 is estimated using CBS data on gross wages in 1985 in The Netherlands, which are available for five levels of education and for nine age groups. There are no separate data for males and females. However, allowing for a difference between men and women is not obvious, since such a distinction would explicitly introduce gender discrimination in the calculations. The gross wages are transformed to wage costs by multiplication factors for specified gross income categories provided by the Central Planning Bureau.

As only 45 observations are available, estimation of Equation 3 for each level of education separately would incur too big a loss of degrees of freedom.[8] Therefore, a joint regression is performed with a dummy variable for each level of education. It is assumed that only the constant term in Equation 3 is different for each level of education, whereas the influence of the number of years of work experience on wage costs is assumed to be the same for all levels of education. The outcome for this regression equation with t-values in parentheses is as follows:

$$\ln y = \underset{(37.6)}{9.19} + \underset{(7.0)}{0.44} \ln(x + \underset{(3.0)}{5.16}) + \underset{(2.7)}{0.13}\, DE$$

$$+ \underset{(6.5)}{0.32}\, DS + \underset{(8.4)}{0.52}\, DH + \underset{(17.7)}{0.90}\, DA$$

$$R^2 = 0.96$$

Explanation of symbols:

y = wage costs in 1985
x = years of work experience $(T-s-6)$
s = years of education
T = age
DE = dummy for extended primary education
DS = dummy for secondary education
DH = dummy for higher vocational education
DA = dummy for academic education.

The outcome of this regression is most satisfactory: all coefficient values differ significantly from zero and both coefficients with respect to work experience obtain the correct sign. Moreover, the coefficient of the dummy variables get plausible values, as they indicate how much higher the earnings of the respective levels of education are as compared to the first level of education (primary school only) given the same number of years of work experience.

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[8]In fact even less than 45 observations are available as some cells of the data matrix are empty.

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